MILITARY SPECIFICATION

HOSE ASSEMBLIES, POLYTETRAFLUOROETHYLENE, ARAMID FIBER REINFORCED, 5000 AND 8000 PSI, GENERAL SPECIFICATION FOR

This specification is approved for use by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification defines the requirements for polytetrafluoroethylene (PTFE) lined, aramid fiber reinforced, hose assemblies with dynamic beam seal end fittings for use in aerospace fluid systems.

1.2 Classification. Hose assemblies shall be of the following type and service.

1.2.1 Type. Type II, -65 to +275°F Temperature Range.

1.2.2 Service. For service to 5000 psi, the hose assembly is suitable for use at the small bend radius. For service above 5000 psi, the hose assembly must be used with the larger bend radius listed in Table II.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-B-566	Boxes, Folding, Paperboard
PPP-B-576	Boxes, Wood, Cleated, Veneer, Paper Overlaid

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 4720

SPECIFICATIONS (Continued)

FEDERAL (Continued)

PPP-B-585	Boxes, Wood, Wirebound
PPP-B-591	Boxes, Shipping, Fiberboard, Wood-Cleated
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Boxes, Shipping, Fiberboard
PPP-B-665	Boxes, Paperboard, Metal Edged and Components
PPP-B-676	Boxes, Setup
TT-I-735	Isopropyl Alcohol

MILITARY

MIL-P-116	Preservation, Methods of
MIL-C-5501	Caps and Plugs, Protective, Dust and Moisture Seal, General Specification for
MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft, Missile and Ordnance
MIL-F-8815	Filter and Filter Elements, Fluid Pressure, Hydraulic Line, 15 Micron Absolute and 5 Micron Absolute, Type II Systems, General Specification for
MIL-S-8879	Screw Threads, Controlled Radius Root With Increased Minor Diameter, General Specification for
MIL-L-8937	Lubricant, Solid Film, Heat Cured, Corrosion Inhibiting (NATO Code Number S-1738)
MIL-L-10547	Liner, Case, and Sheet, Overwrap, Water-Vaporproof or Waterproof, Flexible
MIL-H-46170	Hydraulic Fluid, Rust Inhibited, Fire Resistant, Synthetic Hydrocarbon Base Type II
MIL-C-81302	Cleaning Compound, Solvent Trichlorotri-fluoroethane
MIL-H-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft (NATO Code Number H-537)

SPECIFICATIONS (Continued)

MILITARY (Continued)

MIL-F-85720	Fittings, Tube, Fluid Systems, Separable, High Pressure, Dynamic Beam Seal, General Specification for
MIL-F-85720/1	Fittings, Tube, Fluid Systems, Separable, High Pressure, Dynamic Beam Seal, Design Standard for Male End

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-831	Test Reports, Preparation of
DOD-STD-1000	Engineering Drawing Practices

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or requests for proposal shall apply.

American Society for Testing and Materials (ASTM)

A262	Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels
D380	Standard Methods of Testing Rubber Hose
D412	Rubber Properties in Tension, Test Method for
D792	Specific Gravity and Density of Plastics by Displacement
D1457	Polytetrafluoroethylene, Molding and Extrusion Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

Society of Automotive Engineers (SAE)

ARP 603	Impulse Testing of Hydraulic Hose Assemblies, Tubing and Fittings
AS 611	Tetrafluoroethylene Hose Assembly Cleaning Methods
AMS 3380	Hose, Polytetrafluoroethylene, TFE Fluorocarbon Resin, Wire Braid Reinforced
AMS 4944	Titanium Alloy Tubing, Seamless, Hydraulic, 3.0Al-2.5V Cold Worked, Stress Relieved
AMS 5561	Steel Tubing, Welded and Drawn - 9.0Mn 20Cr 6.5Ni 0.28N, High Pressure Hydraulic

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

(When requesting applicable documents, refer to both title and number.) (Copies of unclassified documents may be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Requests for copies of classified documents sould be addressed to the Naval Publications and Forms Center, via the cognizant Government representative.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for specification sheets), the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification. Hose assemblies furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time set for opening of bids (see 4 and 6). Each hose assembly furnished under this specification shall be a product containing separable, or attachment end configurations, identical to the product which has been inspected and passed the qualification inspection specified herein (see 4.2). The procuring activity shall be responsible for granting qualification approval based on MIL-H-85800 specification and other documents prepared by the original contractor. The contractor-approved qualification test in compliance with this specification for the specific hose assembly used on a specific aircraft shall be acceptable for use on other aircrafts without additional testing, providing the hose assembly as well as the operating temperature and pressure are within the same limits.

3.2 Classification of requirements. The requirements for the product are classified herein as follows:

Requirement	Paragraph
Material	3.3
Design and construction	3.4
Performance	3.5
Item marking	3.6
Workmanship	3.7
Cleaning	3.8

3.3 Material. The hose assembly materials shall be uniform in quality, free from defects, consistent with good manufacturing practice and shall conform to applicable specifications and requirements specified herein. All materials not specifically described herein shall be of the highest quality and suitable for the purpose intended.

3.3.1 Fittings. The material used shall be titanium alloys or corrosion resistant steels as specified in MIL-F-85720. The fitting sockets shall be corrosion resistant steel. The material shall be heat treated, as required, and have suitable surface protection to meet the requirements of this specification.

3.3.2 Sockets. Crimped or swaged sockets of 304 steel shall pass testing per ASTM A262 practice E prior to crimping or swaging. This requirement does not apply to sockets of 321, 347 or 304L corrosion resistant steel.

3.3.3 Tubing. The tubing used as an integral part of the hose end fittings shall be per AMS 4944 or AMS 5561.

3.4 Design and construction. The hose assembly shall consist of a constructed seamless inner tube of virgin polytetrafluoroethylene (PTFE), reinforced with aramid fiber, suitably treated, a black cover and end fittings. The cover shall be colored black to protect the aramid fiber from ultraviolet light and chafing. The aramid fiber shall be a contrasting color to the black cover to allow for the inspection of 100% coverage.

3.4.1 Styles and dimensions. The styles and dimensions shall conform to the design requirements specified herein and applicable drawings as approved by the procuring activity.

3.4.2 Inner tube. The inner tube shall be of seamless construction of uniform gage. It shall have a smooth bore and shall be free from pitting or projections on the inner surface. Additives may be included in the compound from which the tube is extruded.

3.4.3 Reinforcement. The reinforcement shall consist of an aramid braid. The braid shall be so arranged over the inner tube as to provide sufficient strength to insure conformance with the requirements specified herein. Broken reinforcing cords shall be cause for rejection.

3.4.4 Outer protective cover. The aramid fiber reinforcement shall be adequately protected from chafing and long term exposure from ultraviolet rays with the addition of a braided outer protective cover. The outer cover shall be completely entrapped within the fitting socket.

3.4.5 Fittings. The end fittings for the hose assembly shall meet the requirements of MIL-F-85720 and MIL-F-85720/1. The materials shall conform to the applicable specifications listed herein. The outlet design shall be dynamic beam seal type and meet the requirements of MIL-F-85720.

3.4.5.1 Screw threads. All threads shall be in accordance with MIL-S-8879, with the surface finish of the thread flanks being 62Ra maximum. All threads shall be coated with solid film lubricant per MIL-L-8937.

3.4.6 Fluid media. The hose assembly shall be compatible both internally and externally with MIL-H-83282, MIL-H-5606 and MIL-H-46170.

3.4.7 Weight. The hose assembly shall be the lightest weight practical consistent with good design practice that is capable of meeting the requirements of this specification.

3.4.8 Length. Hose assembly lengths and tolerances shall be as specified in the applicable specification sheet.

3.5 Performance.

3.5.1 Inner tube.

3.5.1.1 Tube roll. The tube, without reinforcement braid, shall not leak, split, burst, or show any other evidence of malfunction, when rolled through the sequence of rollers as specified in 4.6.2.1.

3.5.1.2 Tube proof pressure. The tube, without reinforcement braid, shall not leak, burst, nor show any evidence of malfunction when held for a minimum of one minute at the proof pressure specified in Table I.

TABLE I. Tube proof pressure.

Size Dash No.	Flattening Gap Max. (inches)	Rounding Gap Min. (inches)	Proof Pressure (Psi)
-03	.281	.250	380
-04	.281	.250	380
-06	.281	.328	280
-08	.328	.469	220
-10	.328	.578	170
-12	.328	.688	130
-14	.328	.765	110
-16	.328	.828	95

3.5.1.3 Tube tensile strength. When tested in accordance with 4.6.2.2, the longitudinal tensile strength for all sizes of tubes shall be 2200 psi minimum at 77 ± 2°F. The transverse tensile strength for sizes -10 and larger shall be 1800 psi minimum at the same temperature.

3.5.1.4 Specific gravity. The specific gravity values of the hose inner tube shall conform to the specific gravity values as required herein, when tested as specified in 4.6.2.3.

3.5.1.5 Elongation. The elongation of PTFE tube at 77 ± 2°F shall be in accordance with the values specified in 4.6.3.2.

3.5.2 Hose assembly. The hose assembly (complete with reinforcing braid, cover and assembled with fittings) shall meet the following performance requirements.

3.5.2.1 Proof pressure. When tested as specified in 4.6.3.1, the hose assembly shall withstand the proof pressure listed in Table II without malfunction or leakage.

3.5.2.2 Elongation and contraction. The hose assembly shall not change in length by more than ± 0.30 inch in 10 inches of length, when subjected to the operating pressure shown in Table II for a minimum of five minutes. The hose assembly shall be tested in accordance with 4.6.3.2.

3.5.2.3 Volumetric expansion. The volumetric expansion of the hose assembly shall not exceed the limits specified in Table II when tested in accordance with 4.6.3.3.

3.5.2.4 Leakage. The hose assembly shall not leak when subjected to two pressure cycles of 67 percent of minimum burst pressure in Table II when tested in accordance with 4.6.3.4

3.5.2.5 Room temperature burst pressure. The hose assembly shall not leak nor burst at any pressure below the room temperature burst values specified in Table II when tested in accordance with 4.6.3.5.

3.5.2.6 High temperature burst pressure. The hose assembly shall not leak nor burst at any pressure below the high temperature burst value specified in Table II when tested in accordance with 4.6.3.6.

TABLE II. Physical requirements of high pressure hose assemblies.

Size Dash No.	Operating Pressure (Max. psi)	Proof Pressure (Min. psi)	Burst Pressure Room Temp. (Min. psi)	Burst Pressure Hi Temp. (Min. psi)	Min. Bend Radius (Inside of Bend -Inches) Operating Pressure		Volumetric Expansion (cc/in.)
					5000 psi	8000 psi	
-03	8000	16,000	28,000	24,000	1.25	2.50	.09
-04	8000	16,000	28,000	24,000	1.50	3.00	.13
-06	8000	16,000	28,000	24,000	2.50	5.00	.21
-08	8000	16,000	28,000	24,000	2.88	5.75	.35
-10	8000	16,000	28,000	24,000	3.25	6.50	.55
-12	8000	16,000	26,000	22,000	4.00	7.75	.75
-14	8000	16,000	25,000	21,000	4.50	8.75	1.20
-16	8000	16,000	24,000	20,000	5.00	9.63	1.60

3.5.2.7 Thermal shock. The hose assembly shall not leak nor show any evidence of malfunction when exposed to thermal shock of -65 to +275°F when tested in accordance with 4.6.3.7.

3.5.2.8 Impulse. The hose assembly shall be capable of withstanding 200,000 impulse cycles at +275°F when tested in accordance with 4.6.3.8. Testing at both 5000 psi and 8000 psi with the minimum bend radii as specified in Table II is required.

3.5.2.9 Assembly flexibility. The hose assembly shall not leak nor show any evidence of malfunction when flex-cycled from -65 to +275°F when tested in accordance with 4.6.3.9. Testing at both 5000 psi and 8000 psi with the minimum bend radii as specified in Table II is required.

3.5.2.10 Stress degradation. The hose assembly shall not exceed the air leakage as specified when tested in accordance with 4.6.3.10.

3.5.2.11 Pneumatic surge. The inner tube of the hose assembly shall not collapse or show evidence of degradation when tested in accordance with 4.6.3.11.

3.5.2.12 Pneumatic effusion. The hose assemblies, when tested in accordance with 4.6.3.12, shall not exceed the effusion rate specified therein.

3.5.2.13 Overtightening torque. The fitting shall withstand the overtightening torque values specified in Table III when tested in accordance with 4.6.3.13.

TABLE III. Overtightening torque values.

Fitting Size	Inch-Pounds
-03	130
-04	202
-06	360
-08	576
-10	792
-12	1008
-14	1224
-16	1656

3.5.2.14 Conductivity. When tested as specified in 4.6.3.14, hose assemblies of size -03 through -08 shall be capable of conducting a direct current equal to or greater than 6 microamperes, and sizes -10 through -16, a current equal to or greater than 12 microamperes, with a test potential of 1000 volts DC. For all sizes the direct current shall not exceed 10,000 microamperes.

3.6 Item marking.

3.6.1 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of DOD-STD-1000 shall govern the manufacturer's part numbers and changes thereto.

3.6.2 Identification of product. Hose assemblies shall be marked for identification in accordance with MIL-STD-130. The following special markings shall be added:

a. Fittings: The manufacturer's name or trademark shall be permanently marked on all end fittings.

b. Assembly: A permanent marking on the fitting or a permanent band on the assemblies shall be used. The band shall be retained onto the fitting socket and shall not contact the hose cover. The band shall be no wider than 1 inch and shall not impair the flexibility or the performance of the hose or damage the outer fibers. The marking on the fitting or band shall include the following information:

(1) Assembly manufacturer's name or trademark and assembly specification "MIL-H-85800."

(2) Hose manufacturer's Federal Code number.

(3) Operating pressure "Maximum 8000 psi."

(4) Operating temperature "Maximum 275°F."

(5) Pressure test symbol "PT."

(6) Date of hose assembly manufacture expressed in terms of month and year.

3.7 Workmanship. Remove all burrs and break all sharp edges. Sealing surfaces shall be free of detrimental longitudinal and spiral tool marks. Unless a finer finish is specified in applicable drawings, sealing surfaces shall be smooth to a finish of 45Ra, except that annular tool marks up to 45Ra, as defined in ANSI B46.1 will be acceptable. All other machined surfaces shall be smooth to 125Ra maximum and free of burrs and sharp edges. Unmachined surfaces, such as forging surfaces and bar stock flats, shall be free of cracks, laps and seams.

3.8 Cleaning. All hose assemblies shall be free from oil, grease, dirt, or any other foreign materials both internally and externally. Unless otherwise specified, hose assemblies shall be cleaned to Class I of AS 611, except that no chlorinated cleaning solutions may be used in the cleaning process.

3.9 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other

facility suitable for the performance of the inspection requirements specified herein unless disapproved by the procuring activity. The procuring activity reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. Qualification inspection (see 4.4).

(1) Retention. The retention of qualification shall consist of certification by the manufacturer to demonstrate compliance of the qualified hose assemblies with the requirements of this specification. Certification shall be signed by a responsible official of management, attesting that the listed product(s) is still available from the listed plant, can be produced under the same conditions as originally qualified, i.e., same process, materials, construction, design, manufacturer's part number or designation, and meets the requirements of the current issue of the specification. Certification shall be conducted at intervals not exceeding two years. The activity responsible for certification approval is the qualifying activity (see 6.3).

b. Quality conformance inspection (see 4.5).

4.3 Inspection conditions.

4.3.1 Fitting ends. Qualification and quality conformance inspection shall be conducted on assemblies using straight type swivel ends, except four assemblies for impulse test shall have a 90-degree swivel on one end.

4.3.2 Preparation of specimen.

4.3.2.1 Sample lengths. Unless otherwise specified, length of sample hose assemblies shall be in accordance with Table IV.

4.3.2.2 Oil aging. In all the tests using oil aged samples, the hose assemblies shall be fully immersed in MIL-H-83282 hydraulic fluid and soaked in an air oven at a temperature of 275°F for seven days. All air shall be excluded from the bore of the assembly during the test. No pressure shall be applied to the assembly during the aging period.

4.3.2.3 Air aging. Air-aged samples shall be kept in air at a temperature of +275°F for seven days.

4.3.2.4 Unaged assemblies. Unaged assemblies shall be as shipped from the hose assembly manufacturer.

TABLE IV. Length of hose assemblies for test (in inches).

Hose assembly size	Twelve assemblies for impulse test, six for each pressure		Four assemblies for flex test	Six assemblies for other tests 1/
	Operating Pressure			
	5000 psi	8000 psi		
-03	11	15	18	18
-04	12	16	20	18
-06	15	21	27	18
-08	18	24	30	18
-10	21	30	33	18
-12	25	33	37	18
-14	28	37	41	18
-16	31	41	45	18

1/ One additional sample of each size in lengths as shown on Figure 2 shall be used for examination and conductivity tests.

4.3.3 Test conditions.

4.3.3.1 Test fluids. Unless otherwise specified, the pressure test fluid shall be hydraulic oil conforming to MIL-H-83282 or other suitable fluid.

4.3.3.2 Test pressures. Inner tube proof pressures are specified in Table I. Hose assembly test pressures are specified in Table II. Unless otherwise specified, all hose assembly test pressures shall have a tolerance of ±100 psi. Unless otherwise specified, all performance tests in 4.6 shall be conducted with an operating pressure of 8000 psi.

4.3.3.3 Temperature. Except where otherwise specified, the tests shall be conducted at a room temperature of approximately +60 to +100°F and a fluid temperature of +60 to +170°F. Unless otherwise specified, temperature measurements shall be taken within six inches of the hose assemblies under test. Except as otherwise noted, all temperatures shall have a tolerance of ±15°F.

4.3.3.4 Torque. One end of each assembly shall be torqued to the minimum torque value and the other end torqued to the maximum torque value without application of any additional lubricant beyond that supplied by the manufacturer. Torque values for end fittings are specified in MIL-F-85720.

4.4 Qualification inspection. Qualification inspection shall consist of all tests listed in Table V. Test sequence shall be as shown in Table VI.

4.4.1 Qualification test samples. Test samples shall consist of the quantity and length specified in Table IV. The samples shall be capable of mating with the dynamic beam seal type design, per MIL-F-85720.

TABLE V. Qualification inspection.

Inspection	Requirement paragraph	Test method paragraph
Examination of product	3.4 through 3.4.8	4.6.1
Tube roll and proof test	3.5.1.1, 3.5.1.2	4.6.2.1
Tube tensile strength	3.5.1.3	4.6.2.2
Proof pressure test	3.5.2.1	4.6.3.1
Elongation and contraction test	3.5.2.2	4.6.3.2
Volumetric expansion test	3.5.2.3	4.6.3.3
Leakage test	3.5.2.4	4.6.3.4
Room temperature burst pressure test	3.5.2.5	4.6.3.5
High temperature burst pressure test	3.5.2.6	4.6.3.6
Thermal shock test	3.5.2.7	4.6.3.7
Impulse test	3.5.2.8	4.6.3.8
Assembly flex test	3.5.2.9	4.6.3.9
Stress degradation test	3.5.2.10	4.6.3.10
Pneumatic surge test	3.5.2.11	4.6.3.11
Pneumatic effusion test	3.5.2.12	4.6.3.12
Overtightening torque test	3.5.2.13	4.6.3.13
Conductivity test	3.5.2.14	4.6.3.14

TABLE VI. Qualification test sequence.

Assembly numbers	1	2 through 5	6 and 7	8 and 9	10 and 11	12 through 24 1/	25
Inspection sequence	4.6.1 4.6.2.1 4.6.2.2	4.6.1 4.6.3.1 4.6.3.2 4.6.3.9 4.6.3.13 4.6.3.5	4.6.1 4.6.3.12 4.6.3.1 4.6.3.3 4.6.3.6	4.6.1 4.6.3.1 4.6.3.4 4.6.3.7	4.6.1 4.6.3.1 4.6.3.10 4.6.3.11	4.6.1 4.6.3.1 4.6.3.8	4.6.1 4.6.3.1 4.6.3.14

1/ These samples shall have a 90° elbow fitting on one end of the hose, and a straight-type fitting on the other end of the hose. If approval is being sought for both the bent-tube and the forged-elbow configuration then one-half of the samples (6) shall use one type of configurated elbow while the other half of the samples use the other type.

4.4.2 Test report, test samples and data for the procuring activity. When the tests are conducted at a location other than the laboratory of the procuring activity, the following shall be available for furnishing to that activity:

a. Test report in accordance with MIL-STD-831, and shall include a report of all tests and outline description of test conditions.

b. Test samples that were tested and eight untested samples of each size for which tests are desired, if requested by the procuring activity within one year.

c. Engineering data in the form of detail and assembly drawings. The assembly drawings shall have a cut-away section showing all details in their normal assembly position and shall carry part numbers of all details and subassemblies.

d. List of sources of hose or hose components including source's name and product identification for inner tube, hose and assembly.

4.5 Quality conformance inspections. Quality conformance inspections shall be accomplished on hose assemblies for delivery in accordance with the following and the procedures in MIL-STD-105.

a. Individual tests (see 4.5.1) (100 percent inspection).

b. Sampling tests (see 4.5.2).

c. Period controls (see 4.5.3).

4.5.1 Individual tests. Each hose assembly shall be subjected to the following tests:

a. Examination of product of 4.6.1.

b. Proof pressure test of 4.6.3.1.

NOTE: Production samples that are proof pressure tested with water should be air dried prior to capping.

4.5.2 Sampling tests. The following tests shall be performed on hose assemblies individually selected at random from each lot in the order listed. A sampling test lot shall consist of not more than 6600 feet of hose all of one dash size.

a. Elongation and contraction test of 4.6.3.2.

b. Leakage test of 4.6.3.4.

c. Room temperature burst pressure test of 4.6.3.5.

d. Impulse test of 4.6.3.8 (oil-aged samples only).

4.5.3 Periodic control tests. The following tests shall be performed on eight hose assemblies (for each test) individually selected at random from each complete lot. A periodic control test lot shall consist of no more than 20,000 feet of hose, all of one dash size, manufactured under essentially the same conditions.

a. Stress degradation test of 4.6.3.10.

b. Conductivity test of 4.6.3.14.

4.5.4 Rejection and retest. Rejected lots shall be resubmitted for retest and acceptance in accordance with MIL-STD-105. Parts subjected to non-destructive tests and failing to conform to the requirements of these tests shall be rejected. Parts subjected to destructive tests shall be discarded.

4.5.4.1 Report of failure of sampling test. When a hose assembly fails to pass a sampling test, the entire lot represented by the sample shall be rejected. All failures of the tested units shall be reported immediately by telephone or message within 24 hours. Full particulars concerning action taken to correct the defects shall be submitted to the procuring agency in a written test report conforming to DI-R-5299C (see 6.2.1). The lot represented by the unsatisfactory sample shall not be resubmitted until approval of re-submission has been issued by the procuring agency.

4.5.5 Switching procedures. Switching inspection severity levels, for example, from normal to tightened inspection, shall be in accordance with MIL-STD-105. All inspection plans shall be single sample plans with an AQL of 1.0 percent at special inspection level S-2.

4.5.6 Non-destructive test sample. Sampling for material, threads, finish, dimensions, marking, surface defects and workmanship shall be at random in accordance with MIL-STD-105 at an Acceptable Quality Level (AQL) of 4.0 percent unless otherwise specified herein.

4.5.7 Destructive test sample. Prior to testing, a letter (D) shall be impression stamped on each end fitting of hose assemblies used for destructive tests of 4.5.2 and 4.5.3.

4.6 Method of examination and test.

4.6.1 Examination of product. Each length of tubing and hose assembly shall be examined to determine compliance with this specification with respect to material, size, workmanship and dimensions. All hose assemblies shall be visually inspected to determine conformance to this specification and inspected for broken or missing reinforcing braids or other evidence of mal-function which shall be cause for rejection.

4.6.1.1 Packaging inspection. The inspection of the preservation-packaging and interior package marking shall be in accordance with the applicable group quality conformance inspection requirements of MIL-P-116. The inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable packing specification for the proper level and the marking requirements of MIL-STD-129.

4.6.2 Inner tube tests.

4.6.2.1 Tube roll and proof test. Each length of tubing shall be subjected to a tube roll and proof test in accordance with AMS 3380, except

that the flattening gap, rounding gap and proof pressure shall be as specified in Table I. The test fluid shall be either air or water.

4.6.2.2 Tube tensile strength. Size -08 tubes and under shall be subjected to tensile strength tests in accordance with ASTM D412, except that the separation speed shall be two inches per minute. Tubes larger than -10 shall be tested in accordance with ASTM D1457. The longitudinal tensile strength for all sizes shall be a minimum of 2200 psi at 77 ± 2°F. In sizes under -10, the transverse tensile strength need not be tested.

4.6.2.3 Specific gravity of tube.

4.6.2.3.1 Apparent specific gravity. Apparent specific gravity shall be determined in accordance with ASTM D792, Method A, and shall not exceed 2.155 at 77°F ± 2°F. Two drops of wetting agent shall be added to the water. When test samples are prepared from braided hose, the braid impressions must be removed before testing.

4.6.2.3.2 Relative specific gravity. Relative specific gravity shall not exceed a value of 2.190 for all sizes and types of tubes.

4.6.3 Hose assembly tests.

4.6.3.1 Proof pressure test. All hose assemblies shall be pressure tested to the values specified in Table II for not less than 30 seconds and not more than five minutes. Any evidence of leakage from hose or fittings or any other evidence of malfunction shall constitute failure.

4.6.3.2 Elongation and contraction test. Two hose assemblies of each size shall be subjected to the elongation and contraction test. The hose shall not change in length by more than ±0.30 inch in 10 inches of length when subjected to the operating pressure shown in Table II for not less than five minutes. With the hose held in a straight, unpressurized condition, a 10-inch gage length shall be marked off on the hose and the hose then pressurized. After five minutes, while still pressurized, the gage length shall be measured and the change in length shall be calculated.

4.6.3.3 Volumetric expansion test. Two hose assemblies of each size shall be tested in accordance with ASTM D380. The volumetric expansion of the test assemblies shall be in accordance with the values shown in Table II. This test shall be performed at the operating pressure shown in Table II.

4.6.3.4 Leakage test. Two hose assemblies of each size shall be pressurized to 67 percent of the minimum room temperature burst pressure shown in Table II, and held for five minutes minimum. The pressure shall then be reduced to zero psi, after which it shall be raised to 67 percent of the minimum room temperature burst pressure for a final 5-minute check. Any evidence of leakage from hose or fittings, hose burst, fitting blow-off or any other evidence of malfunction shall constitute failure.

4.6.3.5 Room temperature burst pressure test. Two hose assemblies of each size shall be oil aged per 4.3.2.2, then they shall be subjected to a pressure sufficient to burst the assemblies with a rate of pressure rise equal

to 20,000 psi ± 5000 psi per minute. The hose assemblies shall be observed throughout the test and the type of failure and the pressure at which failure occurred shall be recorded. The assemblies shall not leak or show any evidence of malfunction at any pressure below the specified pressure listed in Table II.

4.6.3.6 High temperature burst pressure test. Two hose assemblies of each size shall be oil aged per 4.3.2.2, then they shall be filled with MIL-H-83282 fluid, placed into a suitable container and then into an oven preheated to 275°F. There, the hose assemblies shall be soaked for one hour with ambient and fluid temperature at 275°F. At the end of that period, the assemblies shall be pressurized to proof pressure of Table II for a minimum of five minutes. The pressure shall then be released and while maintaining at 275°F, the pressure shall be increased to failure as described in 4.6.3.5.

4.6.3.7 Thermal shock test. The thermal shock test shall be as follows:

a. Two hose assemblies of each size shall be subjected to this test. One assembly shall be air-aged and one assembly shall be unaged. The assemblies shall be subjected to the proof pressure specified in Table II for a minimum of five minutes.

b. The test assemblies shall then be mounted, empty, in a high temperature test setup (typical setup shown on Figure 1) and the ambient temperature reduced to -65 ±2°F for a minimum of two hours. At the end of this period, while still at this temperature, high temperature test fluid at a temperature of +275°F shall be suddenly introduced at a minimum pressure of 50 psi. Immediately after the hot oil has filled the assembly, the pressure shall be raised to the proof pressure specified in Table II for a minimum of five minutes. Not more than 15 seconds shall elapse between the introduction of the high temperature oil at 50 psi and the raising of the pressure to proof pressure.

c. The test assemblies shall then be filled with one of the high temperature test fluids at a pressure of 75 ± 25 psi and soaked with fluid and ambient temperature maintained at +275°F for one hour. At the end of this period, the assembly shall be pressurized to the proof pressure specified in Table II for a minimum of five minutes. The pressure shall be released and while still maintaining at +275°F, the pressure shall be increased at the same rate of rise as specified in 4.6.3.5 until failure is obtained. The hose assembly shall be under continuous observation during the preceding test and the pressure at which failure occurred and the type of failure shall be recorded.

d. During part (b) and the proof portion of part (c) of the test, any evidence of leakage from the hose or fittings, hose burst, fitting blow-off or any other evidence of malfunction shall constitute failure. During the burst portion of (c), any of the above occurring below the minimum high temperature burst pressure shown in Table II shall constitute failure.

4.6.3.8 Impulse test. The impulse test shall be as follows:

a. Four test assemblies of each size shall be oil-aged, four shall be air-aged and four shall be unaged. The assemblies shall then be subjected at room temperature to a proof pressure specified in Table II for a minimum of five minutes.

b. Six samples, two each oil-aged, air-aged and unaged, shall be tested with a 5000 psi operating pressure, 7500 psi peak pressure and 5000 psi bend radius as specified in Table II. Six samples, two each oil-aged, air-aged and unaged, shall be tested with an 8000 psi operating pressure, 10,800 psi peak pressure and 8000 psi bend radius as specified in Table II. The impulse pattern shall be as specified in ARP 603.

c. Electronic measuring devices shall be used to determine and control the impulse pressure in the inlet manifold. The impulse shall occur at 70 ± 10 cycles per minute (cpm). The test fluid and ambient air shall be maintained at +275°F and measured at the test manifold.

The test shall be run in such a manner that the assemblies shall be temperature cycled from room temperature to specified ambient and fluid temperatures for 200,000 impulse cycles with 80% of the cycles at +275°F and 20% at room temperature. Any evidence of leakage from the hose or fittings prior to the completion of 200,000 impulse cycles for all sizes shall constitute failure.

4.6.3.9 Assembly flexibility test. Four hose assemblies of each size shall be mounted in the assembly flexure test setup as illustrated on Figure 2 and subjected to the following test sequence. Two hose assemblies of each size shall be tested to 5000 psi pressure requirements with the "A" dimension and 5000 psi minimum bend radii as specified herein. Two assemblies of each size shall be tested to 8000 psi pressure requirements with the "A" dimension and 8000 psi minimum bend radii as specified herein. The assemblies shall be filled with one of the high temperature test fluids as specified in 4.3.3.1. Temperature indicated is both fluid and ambient. Flexing shall occur at a rate of 70 ± 10 cpm during portions (c), (d) and (e).

a. The test assemblies shall be soaked with no pressure or flexing at a temperature of -65 ± 2°F for a minimum of one hour.

b. With no flexing, the test assemblies shall be pressurized to the proof pressure as specified in Table II with the temperature still at -65°F for a minimum of five minutes (first cycle only).

c. Flexing shall begin while the test assemblies are pressurized to the operating pressure as specified in Table II with the temperature still at -65°F for a minimum of 4000 cycles.

d. With the pressure reduced to zero psi, flexing shall continue for 1000 cycles at -65°F.

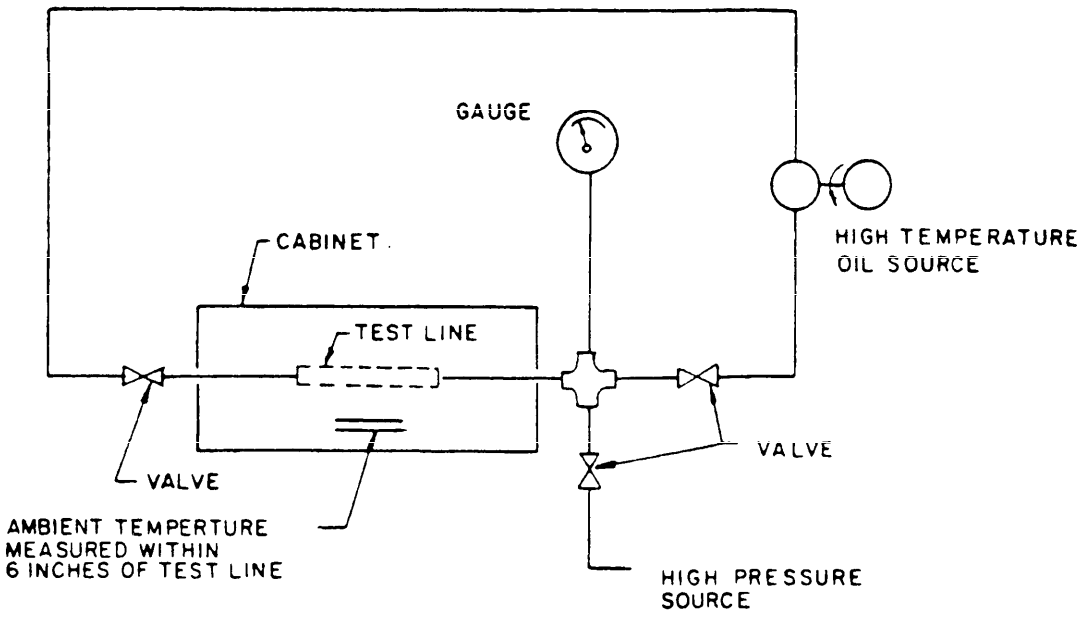
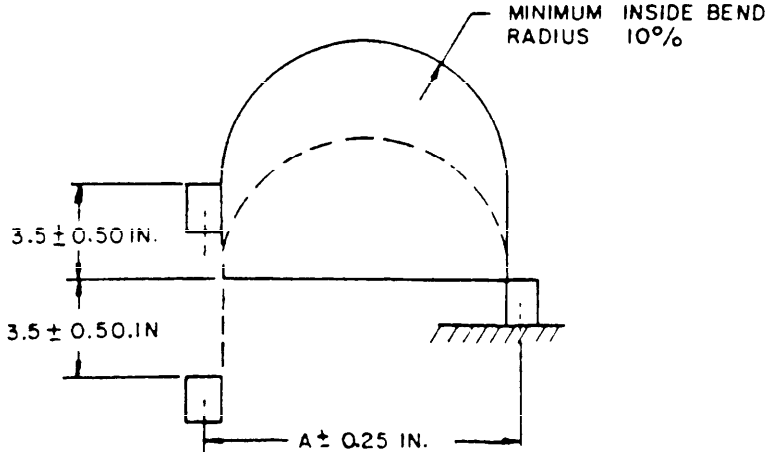


FIGURE 1. Typical setup for thermal shock testing.



Hose size dash number	A (inches) Operating Pressure	
	5000 psi	8000 psi
-03	3.00	6.00
-04	3.50	6.50
-06	5.62	10.62
-08	6.50	12.25
-10	7.25	14.00
-12	9.00	16.62
-14	10.25	18.50
-16	11.12	20.75

FIGURE 2. Assembly flexure test setup.

e. Increase the temperature to +275°F and flex 1000 cycles with the pressure at zero psi. The pressure shall then be increased to the operating pressure as specified in Table II with the temperature held at +275°F. Flexing shall continue until an accumulated total of 80,000 cycles is reached.

f. Steps (a), (c), (d) and (e) shall be repeated for a total of five test sequences, i.e., 400,000 flexing cycles.

g. After completion of step (f) and with no flexing, the test assemblies shall be pressurized to the proof pressure specified in Table II with the temperature still at +275°F for a minimum of five minutes (last cycle only).

Any leakage from the hose or fittings, hose burst, fitting blow-off or any other evidence of malfunction during test shall constitute failure.

4.6.3.10 Stress degradation test. Two hose assemblies of each size shall be subjected to this test.

a. The assemblies shall be filled with test fluid and then placed in an oven which shall be maintained at a temperature of +275°F. Precautions shall be taken to assure that the hose assemblies do not come in contact with parts of the oven that are at a higher temperature. A pressure equal to the rated operating pressure specified in Table II shall be applied to the hose assemblies.

b. After a minimum of 20 hours at +275°F, the pressure shall be gradually released and the assemblies shall be removed from the oven, drained and cooled to room temperature.

c. The hose assemblies shall then be filled with test fluid and a pressure equal to the rated operating pressure specified in Table II shall be applied and held for a minimum of two hours at room temperature.

d. The procedure specified in a, b and c shall be repeated for a total of three times.

e. After the final two-hour pressurization period, the hose assemblies shall be drained and flushed with trichlorotrifluoroethane conforming to MIL-C-81302, and then placed in an oven for one hour. The temperature of the oven shall be maintained at +160 ± 10°F.

f. The hose assemblies shall be removed from the oven, cooled to room temperature, and then subjected to a pneumatic effusion test per 4.6.3.12. To conduct this test, the hose shall be installed in an apparatus similar to that shown on Figure 4.

g. The apparatus with the hose assembly installed shall be immersed in water containing no wetting agent. A pressure equivalent to the rated operating pressure specified in Table II shall be applied for 15 minutes to allow any entrapped air in the hose to escape.

h. The pressure shall be held an additional five-minute period during which time the effused gas shall be collected from the test sample, including the juncture of the hose to the fitting, but not including the "B" nut. After the five-minute period of pressurization, the average rate of effusion through the hose and two fittings shall be computed into cc/in./min. If the average rate of effusion exceeds 2.0 cc/in./min for any size, it shall be cause for rejection and considered failure to qualify.

4.6.3.11 Pneumatic surge test. Two hose assemblies that were subjected to the stress degradation test (4.6.3.10) shall be used for this test. The hose assemblies shall be installed in the test apparatus in accordance with Figure 3.

The assemblies shall be subjected to the rated operating pressure as specified in Table II for 25 minutes at room temperature. After this period of pressurization, the exhaust valve shall be opened within 50 milliseconds to permit rapid discharge of the compressed air or nitrogen gas. After five minutes, the valve shall be closed and the pressure recycled. This sequence of 25 minutes at operating pressure and five minutes at zero pressure shall be repeated a total of 16 times. At the end of this period, the hose shall be sectioned and examined for evidence of tube collapse, sponging of inner tube, etc., and the filter downstream of the hose examined for evidence of inner tube degradation. Any evidence of degradation shall constitute failure.

4.6.3.12 Pneumatic effusion test. Two hose assemblies of each size shall be used for this test. The assemblies shall be subjected to the operating pressure specified in Table II for one hour. Air effusion shall be collected using the water displacement method and air collecting device similar to that depicted in Figure 4. The total amount of effusion through the hose and two fittings shall be collected over the last 1/2 hour of testing. Total effusion shall not exceed 8.0 cc/ft of hose assembly for any size hose.

4.6.3.13 Overtightening torque test. Two hose assemblies with straight swivel ends shall be subjected to this test. Prior to this test, the fittings shall be lubricated with oil (see 4.3.3.1). The fittings shall be tightened to the applicable torque specified in Table III and then loosened. This sequence shall be repeated 15 times. After this sequence, there shall be no evidence of failure or deformation of the fitting assemblies, and the swivel nuts shall be free enough to permit turning on the nipple by hand. After the above tightening torque test sequence, the tested end fittings shall be coupled to a length of hose and subjected to the proof pressure specified in Table II for five minutes without leakage.

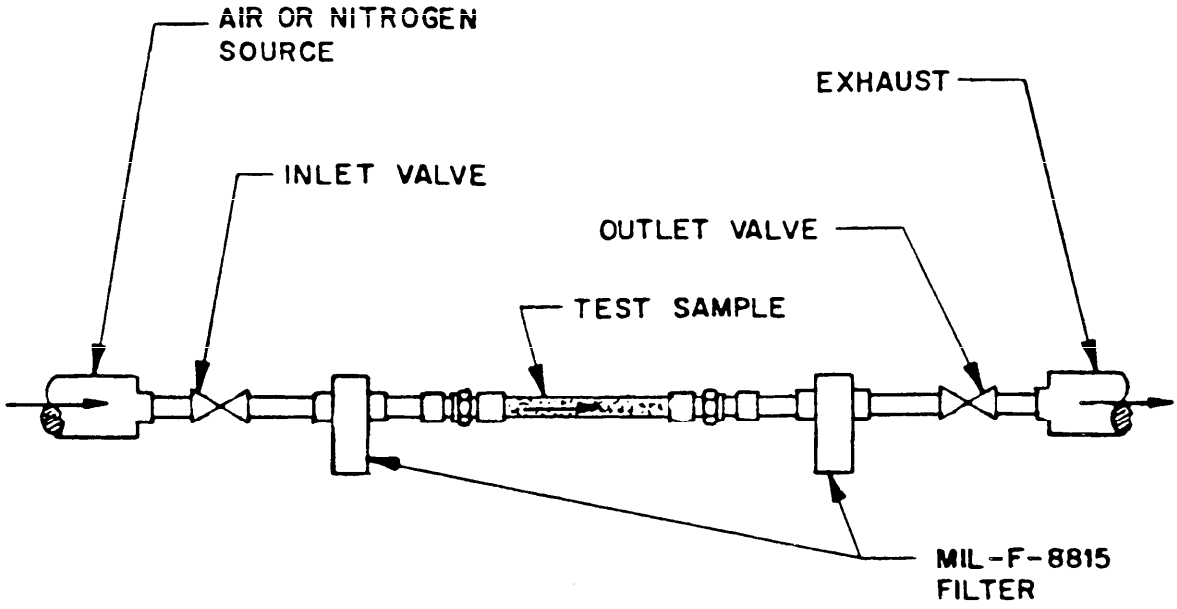


FIGURE 3. Test setup for pneumatic surge test.

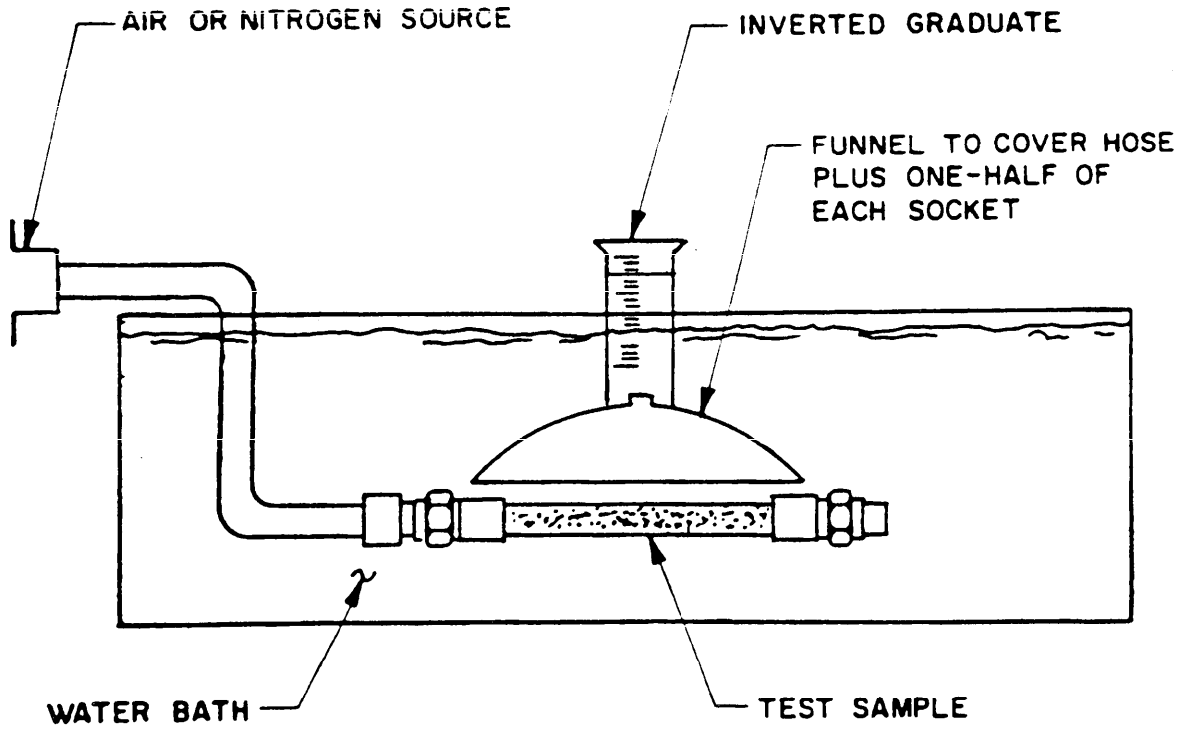
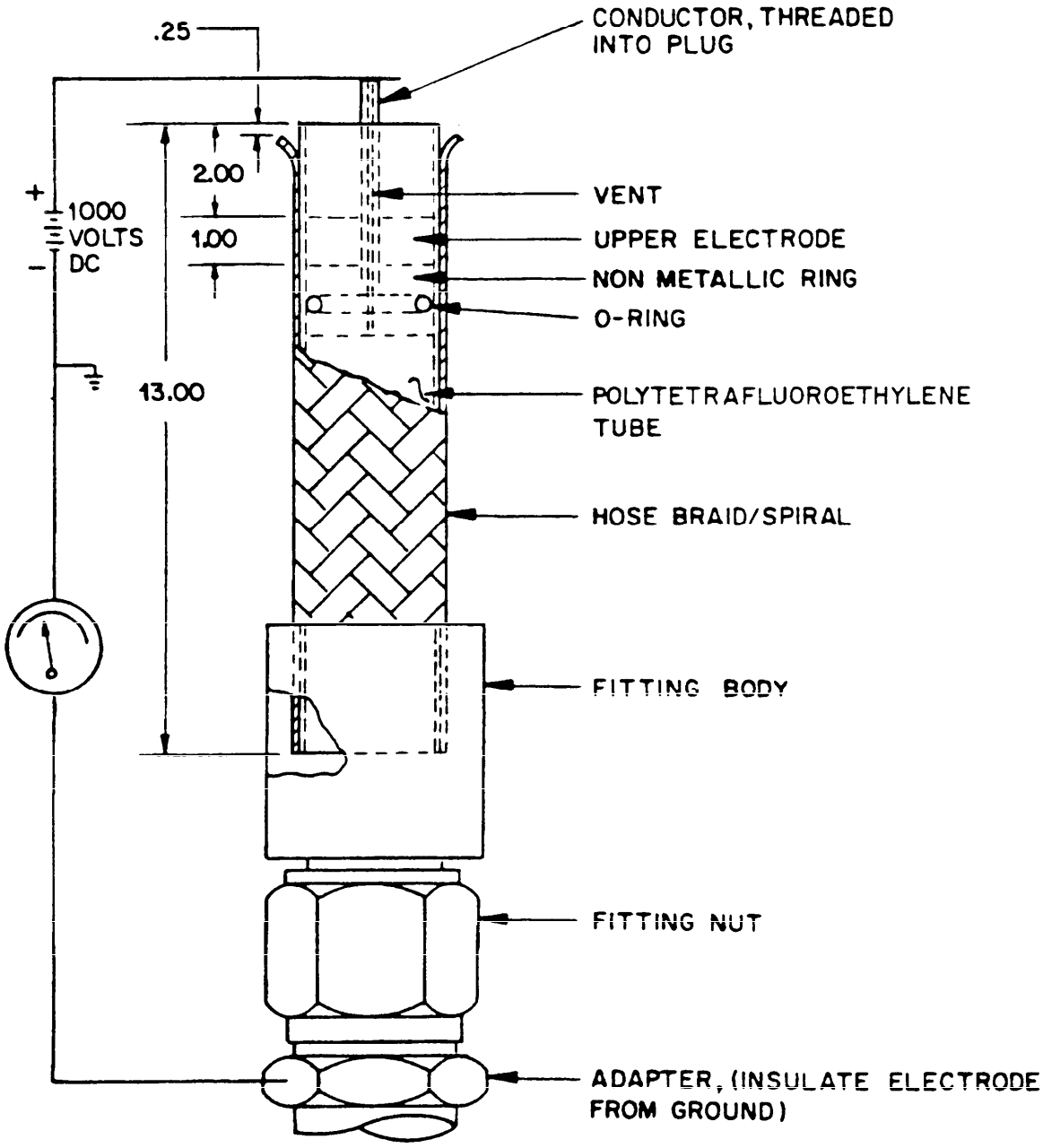


FIGURE 4. Test setup for pneumatic effusion test.



NOTE: DIMENSIONS ARE IN INCHES.

FIGURE 5. Conductivity test diagram.

5.2.2 Level B. Hose assemblies preserved and packaged to meet 5.1.1 shall be packed in domestic-type containers conforming to PPP-B-585, PPP-B-591, PPP-B-601, PPP-B-636, or PPP-B-576. Exterior containers shall be of minimum cube and tare consistent with the protection required. Insofar as practicable, exterior containers shall be of uniform shape and size and shall contain identical quantities. The gross weight of each pack shall be limited to approximately 200 pounds. Containers shall be closed and strapped in accordance with the applicable container specification or appendix thereto. When fiberboard containers are used, the fiberboard shall conform to the special requirements of PPP-B-636.

5.2.3 Level C. Packages which require overpacking for acceptance by the carrier shall be in exterior type shipping containers in a manner that will ensure safe transportation at the lowest rate to the point of delivery. Containers shall meet Uniform Freight Classification Rules or regulations of other common carriers as applicable to the mode of transportation.

5.3 Marking. Interior and exterior shipping containers shall be marked in accordance with MIL-STD-129.

5.3.1 Packing date. The date of packing shall be marked on all interior and exterior containers.

6. NOTES

6.1 Intended use. The hose assemblies covered by this specification are intended for use in aircraft high pressure 5000 and 8000 psi hydraulic systems operating in a temperature range of -65° to +275°F. Do not use in fire zones or as pump discharge line. Do not clamp or restrict the hose braid. The end fittings of these hose assemblies are not intended for reuse. For procurement, this is a critical application item.

6.2 Ordering data. The contract should specify the following:

a. Title, number and date of this specification.

b. Manufacturer's military standard part number or FSCM number, if available.

c. Level of preservation, packaging and packing (see 5.1 and 5.2).

d. Samples subjected to destructive testing are not to be considered or shipped as part of the contract.

6.2.1 Contract data requirements. Items of deliverable data required by this specification are cited in the following paragraphs of the Data Item Description (DID):

Paragraph	Data Requirement	Applicable DID
4.5.4.1	Report of Failure of Sampling Test	DI-R-5299C
4.5	Quality Conformance Test Report	DI-T-5329

Such data will be delivered as described on approved (numbered) DIDs (Date Item Description/DD Form 1664) when specified on DD Form 1423 (Contract Data Requirements List) and incorporated into the applicable contract.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have been actually so listed by that date. The attention of the contractors is called to this requirement and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Air Systems Command, Attn: AIR-530312, Department of the Navy, Washington, DC 20360; however, information pertaining to qualification of products may be obtained from the Commander, Naval Air Development Center (Code 6061), Warminster, PA 18974.

6.4 Subject term (key word) listing.

(a) Hose assemblies

(b) Polytetrafluoroethylene

(c) Aramid fiber

(d) Dynamic beam seal

(e) Aerospace fluid systems

(f) 5000/8000 psi operating pressure

Preparing Activity:
Navy - AS
(Project No. 4720-N001)

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-H-85800 (AS)	HOSE ASSEMBLIES POLYTETRAFLUOROETHYLENE ARAMID FIBER REINFORCED 5000 AND 8000 PSI, GENERAL SPECIFICATION FOR

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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